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Application No. <u>091740,513</u>	Prepared by <u>MPB</u>	Tracking Number <u>05902350</u>	
Examiner-GAU <u>Kerns-1725</u>	Date <u>05/03/04</u>	Week Date <u>2/9/04</u>	
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JACKET			
a. Serial No.	f. Foreign Priority	k. Print Claim(s)	p. PTO-1449
b. Applicant(s)	g. Disclaimer	l. Print Fig.	q. PTOL-85b
c. Continuing Data	h. Microfiche Appendix	m. Searched Column	r. Abstract
d. PCT	i. Title	n. PTO-270/328	s. Sheets/Figs
e. Domestic Priority	j. Claims Allowed	o. PTO-892	t. Other

SPECIFICATION		
a. Page Missing	<p>MESSAGE</p> <p><i>A-amendment is illegible. Please supply legible/clear copies of amendment dated 03/04/02.</i></p> <hr/> <p><i>Mary Ellen Shea 5/12</i></p> <p><i>Beverly Hirth 617-542-2290</i></p> <p><i>AK-339XX</i></p> <p><i>Yunkyu</i></p>	
b. Text Continuity		
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h. Sequence Listing		
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Application No. 09/740,513
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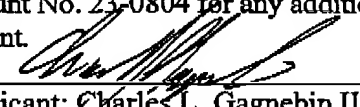
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Dear Mr. Fairchild:

Per your telephone request, enclosed is a copy of the Amendment filed February 25, 2002, together with the transmittal letter, copy of drawing and terminal disclaimer.

I hereby attest that this is a true copy of the Amendment and related papers filed February 25, 2002. I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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Attorney for Applicant: Charles L. Gagnebin III
Registration No. 25,467

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Date: February 25, 2002

COMMISSIONER FOR PATENTS
 Washington, D.C. 20231

Attorney
 Docket No.: AK-339XX

Sir:

In re application of: Kiyoto Takizawa et al.

Entitled: INJECTION MOLDING MACHINE FOR LOW-MELTING POINT METALLIC MATERIAL

Transmitted herewith is an amendment in the above-identified application. The following checked items are applicable:

- ☐ This is a Request for Continued Examination under §1.114; a check in the amount of _____ is enclosed per §1.17(c).
☐ Enter the unentered amendment previously filed on _____ per §1.116.
☒ A Petition for Extension of Time for 2 month is hereby made under §1.136(a); a check in the amount of \$ 400.00 is enclosed per §1.17.
☒ In the event a Petition for Extension of Time is required by this paper and not otherwise provided, such Petition is hereby made and authorization is provided herewith to charge Deposit Account No. 23-0804 for the cost of such extension.
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 Registration No.:

Attorney of Record:
 Registration No.:

- ☒ Other: Letter re: Proposed Drawing Change and copy of Terminal Disclaimer.

Redlined 'A'

CLAIMS AFTER AMENDMENT:	MINUS PRIOR PAID CLAIMS:	EQUALS PRESENT EXTRA CLAIMS:	RATE:	ADDITIONAL FEE:
Independent	1 - 3	= -0-	x \$84.00 =	-0-
Total	7 - 7	= -0-	x \$18.00 =	-0-
<input type="checkbox"/> Multiple Dependent Claims (1st presentation)			+ \$280.00 =	-0-
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Attorney of Record: Charles L. Gagnebin III
 Registration No.: 25,467


PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application : Kiyoto Takizawa, et al.
 Application No. : 09/740, 513
 Filed : December 19, 2000
 For : INJECTION MOLDING MACHINE FOR LOW-MELTING
 POINT METALLIC MATERIAL
 Examiner : K. Kerns
 Attorney's Docket : AK-339XX

Group Art Unit: 1725

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By: 
 Charles L. Gagnebin III
 Registration No. 25,467
 Attorney for Applicant(s)

AMENDMENT*"A" redlined*

Commissioner for Patents
 Washington, D.C. 20231

Sir:

In response to the Office Action dated September 24, 2001,
 please amend the above-identified patent application as follows.
 A marked-up version of the amendments is enclosed herewith for the
 Examiner's convenience.

In the Drawings

Application No. 09/740,513
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Please review and approve the changes to the drawings as enclosed.

In the Specification

Please amend the specification as follows:

Paragraph Extending From Page 6, line 22 to Page 7, line 5.

In the drawings, a reference numeral 1 is an injection mechanism and a reference numeral 2 is a mold-clamping mechanism, are both arranged on an upper surface of a base 3. A reference numeral 4 is a pedestal 4 which is arranged so as to rotate or, advance or retreat freely to the mold-clamping mechanism 2, and a frame 5 constituted by a pair of plate bodies 5a which the upper surface is oblique is provided on the rear portion so as to swivel freely, and the described-above injection mechanism 1 is provided obliquely on the frame 5 in a manner that a nozzle side is directed in a downward direction to the mold-clamping mechanism 2.

Paragraph Extending from Page 7, line 6 to line 17.

The described-above injection mechanism 1 is constituted by a melting cylinder 11, agitating and injection means in the inside, which will be described hereinafter, an injection cylinder 12 provided spacing an interval on the rear-end side of the melting cylinder 11, an electric motor 14 for agitating attached to a

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bifurcated-shape supporting leg 13 arranged an under side of a rear end of the melting cylinder 11, and a feeding device 15 applying the powdered low-melting point metallic material consisting of nonferrous metals into the melting cylinder. The feeding device 15 is constituted by a horizontal cylinder 15a and a screw shaft 15c in the inside thereof which is rotated by an electric motor 15b provided the end of the cylinder. Although being omitted in the drawings, it is constituted by a structure capable of attaching a heater for preheating the material to a surrounding of the cylinder as required.

Paragraph Extending from Page 8, line 6 to line 12.

A supply port 19 is arranged on an upper side of an intermediate portion of such melting cylinder, and the described-above feeding device 15 for the metallic material is connected to the supply port 19 through a pipe passage 20. Moreover, a rear end of the melting cylinder 11 is in the opened condition, and an agitating member 21 and an injection member 22 for the molten metal constituting the described-above agitating and injection means are arranged in the inside from the rear end to the inside.

Paragraph Extending from Page 8, line 13 to line 22.

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The described-above agitating member 21 is constituted by a revolution shaft that agitating wings 24 with a plurality of stripes are formed intermittently so as to swivel freely on an outer periphery of a tip portion of a hollow shaft portion 23 having a through-hole at the central position as shown in Fig. 4. These agitating wings 24 have an external diameter approximately equal to an inner diameter of the melting cylinder 11. Moreover, a flange 25 for a partition which a sealing ring closed proximity to an inner peripheral surface of the melting cylinder 11 is fitted to a the outer periphery is formed unitarily on a periphery of the shaft portion in the rear than the agitating wing 24 of the hollow shaft portion 23.

Paragraph Extending from Page 8, line 23 to Page 9, line 3.

Moreover, a pulley 26 is fixed on the end of the described-above hollow shaft portion 23 projecting from an opening end of the melting cylinder 11, and a timing belt 28 is looped over this pulley 26 and a pulley 27 of a driving shaft end of the described-above electric motor 14, and the agitating member 21 is revolved by the electric motor 14 in the melting cylinder, and the molten metal can be agitated by the described-above agitating wings 24.

Paragraph extending from Page 9, lines 4 - 11.

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The described-above injection member 22 is constituted by an injection rod 29 inserted into a through-hole of the described-above hollow shaft portion 23 and to be provided slidable freely on a central position of the agitating member 21 and an injection plunger 30 attached to the tip end to fit to the described-above weighing chamber 17 from the front surface of the agitating member 21 , and a screw 29a shutting off a molten metal intruded into a clearance between the hollow shaft portion 23 on intermediate region of the injection rod 29 is formed.

Paragraph Extending from Page 11, line 7 to line 14.

Such injection cylinder 12 and described-above melting cylinder 11 are the ends of the described-above supporting legs 13 and 34 projected to both sides of the respective under side and arranged are inserted into support shafts 40 arranged side by side on both sides of an oblique-upper surface of the described-above frame 5, and are attached in a manner that the nozzle member 10 is placed on the lower side and is directed in a downward direction, thereby the described-above injection mechanism 1 installed obliquely to the described-above mold-clamping mechanism 2 to be constituted.

Paragraph Extending from Page 12, line 1 to line 10.

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In the frame 5 constituted by the described-above pair of plate bodies 5a, a support shaft 40 is attached to the inside of a plate body which an upper surface is formed on an surface inclined in an inward direction with an angle of approximately 45° with members 41 at both sides. This frame 5 is placed and arranged on a gate-type receiving seat 6 arranged on the rear end of the described-above pedestal 4 so as to swivel freely (not shown), and the nozzle touch device 48 of the nozzle member 47 provided horizontally on the front surface of the nozzle touch block 45 with member 52 across from a central position of the inside of the receiving seat 6 to the described-above nozzle touch block 45 is arranged.

Paragraph extending from Page 12, lines 14 - 22.

A hydraulic cylinder 49 of this nozzle touch device 48 is fixed to a receiving member 50 of a central position within the pedestal 4 installed on the base 3, moreover, a rod member 51 coupled with a piston rod (not shown) in the inside the tip is coupled with the described-above nozzle touch block 45, and the pedestal 4 is moved in the advancing and/or retreating directions together with the injection mechanism 1 of the upper surface of the frame 5 by a movement of the advancing and/or retreating

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directions of the rod member 51, whereby a touch of the nozzle can be performed to a molding 7 of the described-above nozzle member.

Paragraph Extending from Page 12, line 23 to Page 13, line 7.

The upper of the inside of the described-above nozzle touch block 45 is formed on an inclined rear surface positioning at the right angle to the nozzle member 10 of the described-above injection mechanism 1, and a gate for nozzle-touching is opened and arranged on inclined rear surface. Moreover, a hot runner 53 communicating the described-above nozzle member 47 with the nozzle member 10 of the injection mechanism 2 is bent and formed on the inside of the nozzle touch block, whereby nozzle-touching can be performed without a clearance and a leakage of the molten metal at injection and filling can be prevented, event though the injection mechanism 1 is installed obliquely on the mold-clamping mechanism 2.

Paragraph Extending from Page 13, line 20 to Page 14, line 6.

First, the inside is raised to the high temperature than the melting point by heating the melting cylinder 11 by the band heater 16 of the outer periphery to temperature of approximately 620° to 680°. Next, the hollow shaft portion 23 is made an agitated condition by revolving using the described-above electric

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motor 14 with at a set speed. When applying the powdered metallic material into the melting cylinder 11 from the supply port 19 with the described-above feeding device 15 in such condition, the metallic material is fallen into the melt of the molten metal stored in the region of the agitating wings 24 being revolving together with the hollow shaft portion 23 immediately since the melting cylinder 11 is inclined in a downward direction, whereby it melts due to heat stored in the molten metal, as well as is mixed into the melt by the agitating wings 24. Therefore, it melts in an extremely short time.

Paragraph Extending from Page 15, line 19 to Page 16, line 4.

Agitation of the molten metal by revolution of the described-above agitating wings 24 can be performed continuously, since the agitating member 21 and the injection member 22 are constituted separately, also during such injecting and filling from weighing. According to this operation, melting and keeping warm for the molten metal can be stabilized. Melting of the metallic material is performed by heating from the outside source, and the agitating member 21 has only to prevent nonuniformity in temperature of the metallic material in the melting cylinder molten by heating by revolution, and injecting and weighing is performed by the

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agitating member 21 in the central portion, whereby the melting efficiency of the metallic material can be performed.

Please substitute the following Abstract:

An injection molding machine for low-melting point metallic material has an injection mechanism having a tip portion, a melting cylinder and a rear portion holding a drive mechanism. The tip portion has a weighing chamber and a nozzle member feeding a mold. The melting cylinder is held at an oblique angle to promote gravity flow of the molten metal toward the tip portion. The melting cylinder encloses an agitating and injection means that rotates and advances or retreats freely within the cylinder. One agitating and injection means has a hollow shaft surrounding an injection rod tipped by an injection plunger that moves lengthwise in the shaft and agitating wings disposed around the tip end of the hollow shaft. The wings reach the inner sides of the cylinder and rotate. The plunger may extend beyond the shaft to be inserted in the weighing chamber.

In the Claims

Please rewrite the indicated claims to read as follows:

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1. An injection molding machine for low-melting point metallic material in which the injection molding machine is constituted by:

an injection mechanism having a tip portion, a melting cylinder, and a rear-end portion;

said tip portion having a weighing chamber with a required length communicating with a nozzle member at a first end and with said melting cylinder at a second end;

said melting cylinder having a supply port on an upper side and an agitating and injection means disposed within, said melting cylinder provided obliquely in a manner that a tip portion end is directed in a downward direction such that a molten metal in said melting cylinder flows down by self-weight to be stored in the tip portion, said agitating and injection means adapted to rotate or, advance or retreat freely;

said rear-end portion aligned with and spaced behind an upward end of said melting cylinder including a device driving those means; and ,

a mold-clamping mechanism disposed external to and downward from the nozzle member of said tip portion; wherein said agitating and injection means is constituted by an agitating member in which a plurality of agitating wings are formed intermittently about an outer periphery of a tip portion of a hollow shaft that extends a

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length of said melting cylinder, said agitating wings with an external diameter approximately equal to an inner diameter of the melting cylinder, said hollow shaft having a through-hole at a central position and an injection rod having an injection plunger attached unitarily to a tip of said injection rod inserted into said through-hole, said injection plunger freely slidable in a central portion of the agitating member and extendable beyond the tip of the agitating member so as to insert into said weighing chamber freely.

2. The injection molding machine for low-melting point metallic material according to claim 1, wherein said injection rod has a screw shutting off a molten metal intruding into a clearance between said injection rod and a hollow shaft portion on an intermediate region of said hollow shaft.

3. The injection molding machine for low-melting point metallic material according to claim 1, wherein said injection plunger is provided with a high-temperature resistant sealing ring on an outer periphery of a tip portion of said injection plunger and has a flowing port through the inside of the tip of a conical plunger to a fitting groove of the sealing ring.

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4. The injection molding machine for low-melting point metallic material according to claim 1, further comprising:

a base supporting said mold-clamping mechanism;

a pedestal on said base spaced apart from said mold-clamping mechanism;

a frame installed on said pedestal having an inclined upper surface incorporating a pair of support shafts at a lower end of said upper surface;

a hydraulic cylinder spaced a required interval from said upward end of said melting cylinder, said hydraulic cylinder oriented in a downward direction, an upper end of said hydraulic cylinder at a tip portion of said frame; and

supporting legs, projecting from a lower side of said hydraulic cylinder said supporting legs inserted respectively in said support shafts; wherein a nozzle touch device is formed when said injection rod is unitarily coupled by a tie bar across said interval to said hydraulic device.

5. The injection molding machine for low-melting point metallic material according to claim 1, wherein a driving device for said agitating member is constituted by an electric motor, which is provided on sides of a supporting legs of the melting cylinder so as to move together with said melting cylinder.

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6. The injection molding machine for low-melting point metallic material according to claim 4, further comprising:

a nozzle touch block interposed between said mold-clamping mechanism and said pedestal and on the lower tip of said nozzle touch device, wherein said nozzle touch device is placed on said pedestal so as to swivel freely and wherein touching a nozzle member attached to the front of the nozzle touch block to moldings is performed by moving the pedestal and nozzle touching device to the mold-clamping mechanism across the nozzle touch block and a rear of an upper surface of the base.

7. The injection molding machine for low-melting point metallic material according to claim 4, wherein said nozzle touch block comprises:

a second nozzle member provided horizontally on a front face of said nozzle touch block aligned with an opening in said mold-clamping mechanism;

an inclined rear surface of said nozzle touch block positioned on an upper inner side;

a gate for nozzle-touching formed on said inclined rear surface communicating with the nozzle member of said injection mechanism; and

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a hot runner bent formed within the nozzle touch block
connecting said second nozzle member and said gate.

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REMARKS

Claims 1- 7 were before the Office. In the Office Action of September 24, 2001, the drawings were objected to, the specification was objected to, the abstract was cited for being too long, claims were objected to, claims were rejected under 35 U.S.C. 112 and 103 and Claim 1 was rejected under the judicially created doctrine of obviousness-type double patenting. Applicant herewith submits amended drawings, amends the specification, abstract and claims, and submits a terminal disclaimer. Claims 1-7 are before the Office.

Corrected Drawings of Figures 1 and 2 change old reference number "11a" to reference number "16". The specification has been modified to refer to reference number "5a".

An abstract of the proper length is herewith submitted.

The specification has been amended to remove the objected to informalities.

The claims have been amended to remove the informalities.

Claim 1 has been amended to provide antecedent basis, remove the reference to "plurality of stripes", and to positively claim the invention.

Claim 3 has been amended to improve antecedent basis.

Claim 4 has been amended to improve antecedent basis and definiteness and positively claim the invention.

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Claim 6 and 7 has been amended to positively claim the invention.

A Terminal Disclaimer in compliance with 37 CFR 1.321(c) accompanies this response to overcome the provisional rejection under the judicially created doctrine of obviousness-type double patenting. A certificate under 37 CFR § 3.73 is not currently available but will be forthcoming.

Claims 1-7 were rejected under 35 USC §103(a) over Bradley et al. US Patent No. 5,040,589 in view of Kono US Patent No. 5,982,976 and further in view of Kono US Patent No. 5,836,372. Applicant traverses the rejection.

Amended Claim 1 recites an injection molding machine for low-melting point metallic material in which the injection molding machine is constituted by an injection mechanism having a tip portion, a melting cylinder, and a rear-end portion. The tip portion having a weighing chamber with a required length communicating with a nozzle member at a first end and with the melting cylinder at a second end. The melting cylinder having a supply port on an upper side and an agitating and injection means disposed within. The melting cylinder provided obliquely in a manner that a tip portion end is directed in a downward direction so that a molten metal in said melting cylinder flows down by self-weight to be stored in the tip portion. The said agitating

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and injection means is adapted to rotate or advance or retreat freely. The rear-end portion is aligned with and spaced behind an upward end of the melting cylinder and includes a device for driving those agitating and injection means. The injection molding machine further includes a mold-clamping mechanism disposed external to and downward from the nozzle member of the tip portion. An implementation of the agitating and injection means is constituted by an agitating member in which a plurality of agitating wings are formed intermittently about an outer periphery of a tip portion of a hollow shaft that extends a length of the melting cylinder. The agitating wings have an external diameter approximately equal to an inner diameter of the melting cylinder. The hollow shaft having a through-hole at a central position, an injection rod having an injection plunger attached unitarily to a tip of said injection rod is inserted into said through-hole. The injection plunger is freely slidable in a central portion of the agitating member and extendable beyond the tip of the agitating member so as to insert into said weighing chamber freely.

The Bradley reference shows a method and apparatus for molding a metal alloy where the alloy is maintained in a thixotropic, semi-solid, state in a reciprocating extruder at temperatures above its solidus temperature and below its liquidus

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temperature. The thixotropic slurry is injected into the mold. The material to be injected is held either between the vanes of the screw or in an accumulation chamber (C).

The Kono ('976) reference shows an melted metal die casting method that uses a pair of elongated chambers, one for heating the metal and the other for injecting the metal. The heating chamber is elevated, while the injecting chamber is horizontal.

The Kono ('372) reference shows a thixotropic (semi-solid) process where metal alloy is made liquid in a feeder, cooled to the thixotropic state in an inclined barrel, held at a thixotropic state in a horizontal accumulation chamber, and injected through an exit port by a horizontal injection barrel

The Bradley and Kono references do not make the invention obvious because it is not logical to combine the references and because combined they do not show the invention.

It is not logical to combine the references because they deal with metal in different states - thixotropic for Bradley and Kono ('372) and liquid for Kono ('976). These states require different handling because the viscosity of thixotropic metals is significantly higher than liquid metals. As explained in the background section, liquids do not exhibit the same viscosity as slurries and so cannot reliably build pressures as the slurries in

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the above references. Further Kono ('976) critiques thixotropic processes as producing parts that require further finishing.

Even if it were logical to combine the references, the references do not show the invention because the Bradley reference does not show injection mechanisms for liquid metal but rather for thixotropic, that is semi-solid, metal. Therefore, it is not obvious that the process shown in Bradley would work for liquid metal. None of the references show the use of a single inclined mechanism that receives material from a feeder, holds molten metal, and accommodates a plunger in the inclined chamber. Bradley uses a horizontal chamber, while both Kono references parse these functions between two chambers, only one of which is inclined. Indeed, in Col 1, lines 51-56, Kono ('976) criticizes the use of a single chamber as making it difficult to accurately control all the parameters.

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The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

KIYOTO TAKIZAWA ET AL.

By: 

Charles L. Gagnebin III
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Attorney for Applicant(s)

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Enclosure
265901-1

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MARKED-UP VERSION OF SPECIFICATION PARAGRAPHS

Paragraph Extending From Page 6, line 22 to Page 7, line 5.

In the drawings, a reference numeral 1 is an injection mechanism and a reference numeral 2 is a mold-clamping mechanism, are both arranged on an upper surface of a base 3. A reference numeral 4 is a pedestal 4 which is arranged so as to rotate or, advance or retreat freely to the mold-clamping mechanism 2, and a frame 5 constituted by a pair of plate bodies ~~51 and 51~~ 5a which the upper surface is oblique is provided on the rear portion so as to swivel freely, and the described-above injection mechanism 1 is provided obliquely on the frame 5 in a manner that a nozzle side is directed in a downward direction to the mold-clamping mechanism 2.

Paragraph Extending from Page 7, line 6 to line 17.

The described-above injection mechanism 1 is constituted by a melting cylinder 11, agitating and injection means in the inside, which will be described hereinafter, an injection cylinder 12 provided spacing an interval on the rear-end side of the melting cylinder 11, an electric motor 14 for agitating attached to a bifurcated-shape supporting leg 13 arranged an under side of a rear end of the melting cylinder 11, and a feeding~~feeding~~ device 15

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applying the powdered low-melting point metallic material consisting of nonferrous metals into the melting cylinder. The ~~feeding~~feeding device 15 is constituted by a horizontal cylinder 15a and a screw shaft 15c in the inside thereof which is rotated by an electric motor 15b provided the end of the cylinder. Although being omitted in the drawings, it is constituted by a structure capable of attaching a heater for preheating the material to a surrounding of the cylinder as required.

Paragraph Extending from Page 8, line 6 to line 12.

A supply port 19 is arranged on an upper side of an intermediate portion of such melting cylinder, and the described-above ~~feeding~~feeding device 15 for the metallic material is connected to the supply port 19 through a pipe passage 20. Moreover, a rear end of the melting cylinder 11 is in the opened condition, and an agitating member 21 and an injection member 22 for the molten metal constituting the described-above agitating and injection means are arranged in the inside from the rear end to the inside.

Paragraph Extending from Page 8, line 13 to line 22.

The described-above agitating member 21 is constituted by a revolution shaft that agitating wings 24 ~~and 24~~ with a plurality

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of stripes are formed intermittently so as to swivel freely on an outer periphery of a tip portion of a hollow shaft portion 23 having a through-hole at the central position as shown in Fig. 4. These agitating wings 24 and ~~24~~ have an external diameter approximately equal to an inner diameter of the melting cylinder 11. Moreover, a flange 25 for a partition which a sealing ring closed proximity to an inner peripheral surface of the melting cylinder 11 is fitted to a the outer periphery is formed unitarily on a periphery of the shaft portion in the rear than the agitating wing 24 of the hollow shaft portion 23.

Paragraph Extending from Page 8, line 23 to Page 9, line 3.

Moreover, a pulley 26 is fixed on the end of the described-above hollow shaft portion 23 projecting from an opening end of the melting cylinder 11, and a timing belt 28 is looped over this pulley 26 and a pulley 27 of a driving shaft end of the described-above electric motor 14, and the agitating member 21 is revolved by the electric motor 14 in the melting cylinder, and the molten metal can be agitated by the described-above agitating wings 24 and ~~24~~.

Paragraph extending from Page 9, lines 4 - 11.

The described-above injection member 22 is constituted by an injection rod 29 inserted into a through-hole of the

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described-above hollow shaft portion 23 and to be provided slidable freely on a central position of the agitating member 21 and an injection plunger 30 attached to the tip and end to fit to the described-above weighing chamber 17 from the front surface of the agitating member 21, and a screw 29a shutting off a molten metal intruded into a clearance between the hollow shaft portion 23 on intermediate region of the injection rod 29 is formed.

Paragraph Extending from Page 11, line 7 to line 14.

Such injection cylinder 12 and described-above melting cylinder 11 are the ends of the described-above supporting legs 13 and 34 projected to both sides of the respective under side and arranged are inserted into support shafts 40 and ~~40~~ arranged side by side on both sides of an oblique-upper surface of the described-above frame 5, and are attached in a manner that the nozzle member 10 is placed on the lower side and is directed in a downward direction, thereby the described-above injection mechanism 1 installed obliquely to the described-above mold-clamping mechanism 2 to be constituted.

Paragraph Extending from Page 12, line 1 to line 10.

In the frame 5 constituted by the described-above pair of plate bodies ~~51~~ and ~~51a~~, a support shaft 40 is attached to the

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inside of a plate body which an upper surface is formed on an surface inclined in an inward direction with an angle of approximately 45° with members 41 and ~~41~~ at both sides. This frame 5 is placed and arranged on a gate-type receiving seat 6 arranged on the rear end of the described-above pedestal 4 so as to swivel freely (not shown), and the nozzle touch device 48 of the nozzle member 47 provided horizontally on the front surface of the nozzle touch block 45 with member 52 across from a central position of the inside of the receiving seat 6 to the described-above nozzle touch block 45 is arranged.

Paragraph extending from Page 12, lines 14 - 22.

A hydraulic cylinder 49 of this nozzle touch device 48 is fixed to a receiving member 50 of a central position within the pedestal ~~6-4~~ installed on the base 3, moreover, a rod member 51 coupled with a piston rod (not shown) in the inside the tip is coupled with the described-above nozzle touch block 45, and the pedestal 4 is moved in the advancing and/or retreating directions together with the injection mechanism 1 of the upper surface of the frame 5 by a movement of the advancing and/or retreating directions of the rod member 51, whereby a touch of the nozzle can be performed to a molding 7 of the described-above nozzle member.

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Paragraph Extending from Page 12, line 23 to Page 13, line 7.

The upper of the inside of the described-above nozzle touch block 45 is formed on an inclined rear surface positioning at the right angle to the nozzle member 10 of the described-above injection mechanism 1, and a gate for nozzle-touching is opened and arranged on inclined rear surface. Moreover, a hot runner 53 communicating the described-above nozzle member 47 with the nozzle member 10 of the injection mechanism 2 is bent and formed on the inside of the nozzle touch block, whereby nozzle-touching can be performed without a clearance and a leakage of the molten metal at injection and filling can be prevented, event though the injection mechanism 1 is installed obliquely on the mold-clamping mechanism 32.

Paragraph Extending from Page 13, line 20 to Page 14, line 6.

First, the inside is raised to the high temperature than the melting point by heating the melting cylinder 11 by the band heater 16 of the outer periphery to temperature of approximately 620° to 680°. Next, the hollow shaft portion 23 is made an agitated condition by revolving using the described-above electric motor 14 with at a set speed. When applying the powdered metallic material into the melting cylinder 11 from the supply port 19 with the described-above feedingfeeding device 15 in such condition, the

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metallic material is fallen into the melt of the molten metal stored in the region of the agitating wings 24 ~~and 24~~ being revolving together with the hollow shaft portion 23 immediately since the melting cylinder 11 is inclined in a downward direction, whereby it melts due to heat stored in the molten metal, as well as is mixed into the melt by the agitating wings 24 ~~and 24~~. Therefore, it melts in an extremely short time.

Paragraph Extending from Page 15, line 19 to Page 16, line 4.

Agitation of the molten metal by revolution of the described-above agitating wings 24 ~~and 24~~ can be performed continuously, since the agitating member 21 and the injection member 22 are constituted separately, also during such injecting and filling from weighing. According to this operation, melting and keeping warm for the molten metal can be stabilized. Melting of the metallic material is performed by heating from the outside source, and the agitating member 21 has only to prevent nonuniformity in temperature of the metallic material in the melting cylinder molten by heating by revolution, and injecting and weighing is performed by the agitating member 21 in the central portion, whereby the melting efficiency of the metallic material can be performed.

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MARKED-UP VERSION OF ABSTRACT

~~Low melting point metallic material is designed to be able to melt with an inclined melting cylinder installed in the condition of combining an injection member with an agitating member therein, and a molten metal is designed to be able to weigh and inject by a plunger, whereby molding accuracy and efficiency can be improved more than die cast. An injection mechanism 2 is constituted by a melting cylinder 11 which a weighing chamber 17 communicating with a nozzle member 5 is provided on the inside of the tip, agitating and injection means provided in the combined condition in the melting cylinder so as to rotate or, advance or retreat freely and a device driving agitating and injection means, which is arranged on an rear-end side of the melting cylinder. The injection mechanism 2 is provided obliquely in a manner that a nozzle member side is directed in a downward direction to a mold clamping mechanism 1. The agitating and injection means is constituted by an agitating member 24 in which agitating wings having a plurality of stripes with an external diameter approximately equal to an inner diameter of the melting cylinder are formed intermittently on an outer periphery of a tip portion of a hollow shaft portion 23 having a through hole at the central position and an injection plunger 30 attached unitarily to a tip for an injection rod 29 inserted into the through hole and provided slidably freely on a~~

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~~central position of the agitating member 21 and provided so as to
insert into the weighing chamber 17 freely.~~

An injection molding machine for low-melting point metallic material has an injection mechanism having a tip portion, a melting cylinder and a rear portion holding a drive mechanism. The tip portion has a weighing chamber and a nozzle member feeding a mold. The melting cylinder is held at an oblique angle to promote gravity flow of the molten metal toward the tip portion. The melting cylinder encloses an agitating and injection means that rotates and advances or retreats freely within the cylinder. One agitating and injection means has a hollow shaft surrounding an injection rod tipped by an injection plunger that moves lengthwise in the shaft and agitating wings disposed around the tip end of the hollow shaft. The wings reach the inner sides of the cylinder and rotate. The plunger may extend beyond the shaft to be inserted in the weighing chamber.

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MARKED-UP VERSION OF CLAIM AMENDMENTS

CLAIM-1. An injection molding machine for low-melting point metallic material in which the injection molding machine is constituted by:

a ~~melting cylinder~~an injection mechanism having a tip portion, a melting cylinder, and a rear-end portion;

said tip portion having a weighing chamber with a required length communicating with a nozzle member at a first end and with said melting cylinder at a second end;~~within a tip portion~~

said melting cylinder and having a supply port on an upper side of an intermediate portion; and an agitating and injection means disposed within, said melting cylinder provided obliquely in a manner that a tip portion end is directed in a downward direction such that a molten metal in said melting cylinder flows down by self-weight to be stored in the tip portion;~~agitating and injection means provided in the inside thereof, said agitating and injection means adapted so as to rotate or, advance or retreat freely;~~

said rear-end portion aligned with and spaced behind an upward end of said melting cylinder including and a device driving those means; and which is arranged as an rear end side of the melting cylinder, and the injection mechanism is provided obliquely in a manner that a nozzle member side is directed in a

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~~downward direction to a mold clamping mechanism such that a molten metal in the inside flows down by self-weight and to be stored in the tip portion of the melting cylinder,~~

a mold-clamping mechanism disposed external to and downward from the nozzle member of said tip portion;

~~—wherein said agitating and injection means is constituted by an agitating member in which a plurality of agitating wings having a plurality of stripes are formed intermittently about an outer periphery of a tip portion of a hollow shaft that extends a length of said melting cylinder, said agitating wings with an external diameter approximately equal to an inner diameter of the melting cylinder, are formed intermittently on an outer periphery of the tip portion of a hollow shaft portion said hollow shaft having a through-hole at the a central position and an injection rod having an injection plunger attached unitarily to a tip of an said injection rod inserted into said through-hole, said injection plunger and provided freely slidableyfreely on in a central portion of the agitating member and provided onextendable beyond the tip of the agitating member so as to insert into said weighing chamber freely.~~

CLAIM-2. The injection molding machine for low-melting point metallic material according to claim 1, wherein said injection rod

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has a screw shutting off a molten metal ~~intruded~~ intruding into a clearance between said injection rod and a hollow shaft portion on an intermediate region of said hollow shaft.

~~CLAIM 3.~~ The injection molding machine for low-melting point metallic material according to claim 1, wherein said injection plunger is provided with a high-temperature resistant sealing ring on an outer periphery of ~~the~~ a tip portion of said injection plunger and has a flowing port through ~~a fitting groove of the sealing ring and the inside of the tip of a conical plunger in the inside~~ to a fitting groove of the sealing ring.

~~CLAIM 4.~~ The injection molding machine for low-melting point metallic material according to claim 1, further comprising:

a base supporting said mold-clamping mechanism;

a pedestal on said base spaced apart from said mold-clamping mechanism;

a frame installed on said pedestal having an inclined upper surface incorporating a pair of support shafts at a lower end of said upper surface;

~~wherein said injection plunger is constituted by providing a nozzle touch device constituted by a hydraulic cylinder unitarily~~

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~~coupled by a tie bar, spaced~~spacing a required interval ~~on a rear~~
~~end~~from said upward end ~~side~~ of said melting cylinder, said
hydraulic cylinder oriented in a downward direction, an upper end
of said hydraulic cylinder at a tip portion of said frame; and

supporting legs, projecting from a lower side of said
hydraulic cylinder ~~and provided in a downward direction on a~~
~~frame by inserting said supporting legs inserted respectively in~~
~~said support shafts~~which both of them are projected and arranged
toward a lower side into a pair of support shafts of an inclined
upper surface of the frame installed on a pedestal on a base and;
wherein a nozzle touch device is formed when said injection rod is
unitarily coupled by a tie bar across said interval to said
hydraulic device~~constituted by the hydraulic cylinder and the rod~~
~~across the hydraulic cylinder side and an upper of a tip portion~~
of said pedestal.

CLAIM 5. The injection molding machine for low-melting point
metallic material according to claim 1, wherein a driving device
for said agitating member is constituted by an electric motor,
which is provided on sides of a supporting legs of the melting
cylinder so as to move together with said melting cylinder.

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~~CLAIM-6.~~ The injection molding machine for low-melting point metallic material according to claim 14, further comprising:
~~wherein said pedestal is constituted by a nozzle touch device provided on an upper surface of a base so as to rotate or, advance or retreat freely to said mold-clamping mechanism, and having~~
a nozzle touch block interposed between said mold-clamping mechanism and said pedestal and on the lower tip of said nozzle touch device, wherein said nozzle touch device is placed on said pedestal as well as provided by placing said frame on the pedestal provided on the rear so as to swivel freely and constituted by the rod and the hydraulic cylinder and wherein nozzle-touching the a
nozzle member attached to the front of the nozzle touch block to moldings is performed by moving the pedestal and nozzle touching device to the mold-clamping mechanism together with the frame and said injection mechanism across the nozzle touch block and a rear of an upper surface of the base.

~~CLAIM-7.~~ The injection molding machine for low-melting point metallic material according to claim 14, wherein said nozzle touch block is constituted by providing comprises: the nozzle member on a front face of said mold-clamping mechanism,

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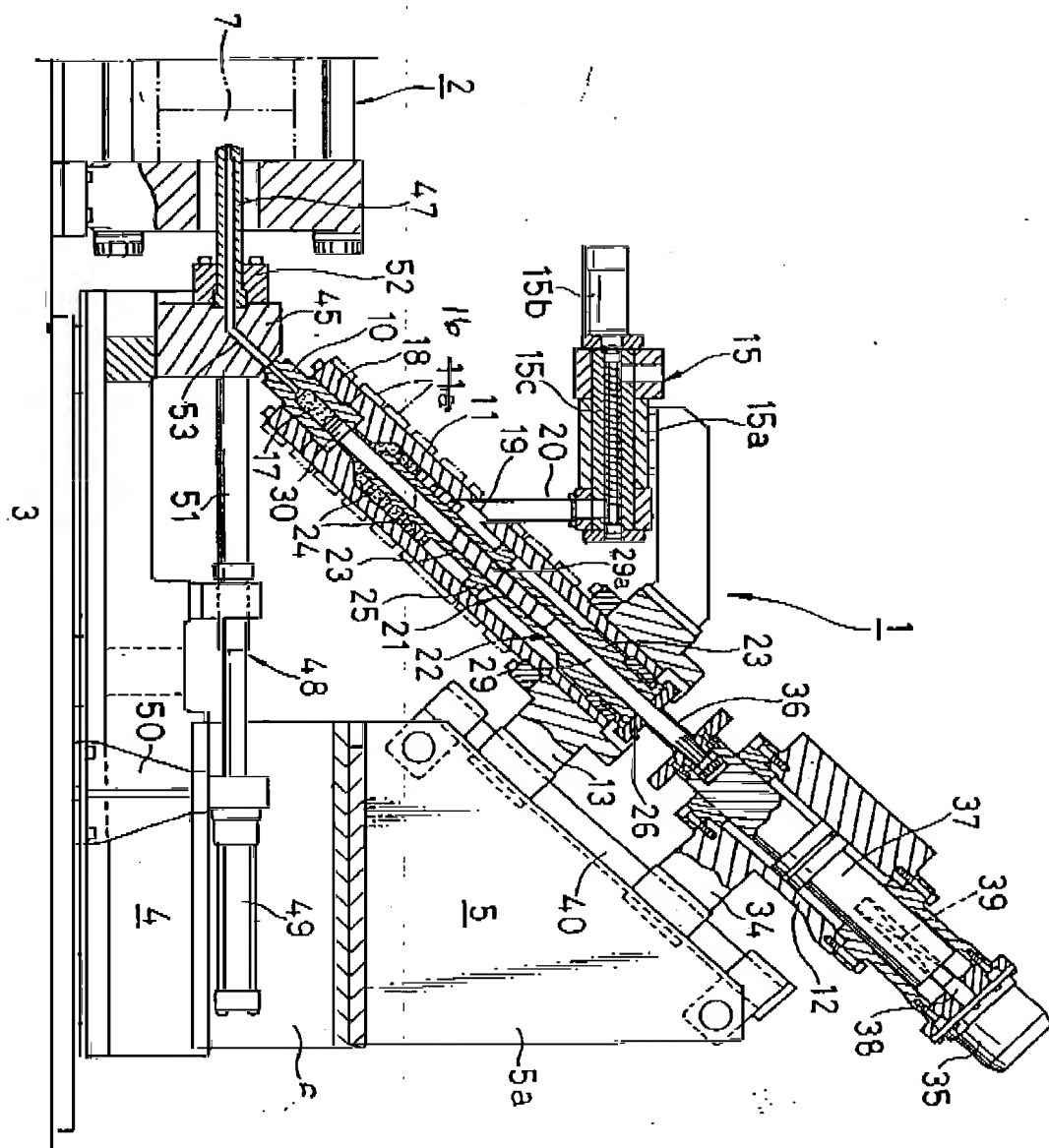
a second nozzle member provided horizontally on a front face
of said nozzle touch block aligned with an opening in said mold-
clamping mechanism;

an inclined rear surface of said nozzle touch block as well
as inpositioned on an upper of the inner side;

-communicating a gate for nozzle-touching framed formed on an
said inclined rear surface communicating with which the nozzle
member of said injection mechanism; and

-touches on the nozzle member of a front surface and provided
in an inclined rear surface through a hot runner bent formed
within the nozzle touch block connecting said second nozzle member
and said gate.

DOCKET REFERENCE



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01/21/2002 15:27 FAX 16176950892

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application : Miyoto Terizawa, et al.
 Application No. : 09/740,513
 Filed : December 19, 2000
 For : INJECTION MOLDING MACHINE FOR LOW-MELTING
 POINT METALLIC MATERIAL
 Examiner : K. KELTIE
 Attorney's Docket : AK-232XX

Group Art Unit: 1725

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 Charles L. Goggin III
 Registration No. 25,467
 Attorney for Applicant(s)

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 in U.S. Patent Application No. 09/740,513, filed on December 19, 2000,
 for INJECTION MOLDING MACHINE FOR LOW-MELTING POINT METALLIC MATERIAL.
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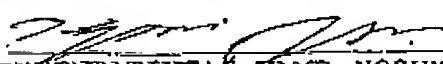
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[] The undersigned is an attorney of record.

Respectfully submitted,

NISSEI PLASTIC INDUSTRIAL CO., LTD.

By: 
REPRESENTATIVE'S NAME: HOZUMI YODA
REPRESENTATIVE'S TITLE: PRESIDENT

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